

REMARKS

The specification has been objected to in the Office Action. A substitute specification and abstract are attached hereto. No new matter has been added.

Claims 1-7 and 9 have been rejected under 35 USC 102(e) as anticipated by Chudzik. The rejection is respectfully traversed.

Chudzik discloses a method for producing a trench capacitor by means of a single trench 100. In contrast, in the present invention, a first trench 2 is provided in the semiconductor substrate, the semiconductor substrate 1 in the first trench 2 is oxidized for providing an oxidized silicon layer 3 and a conformal aluminum-oxide layer 4 is deposited in the first trench 2. After removing the horizontal regions 5 of the deposited aluminum-oxide layer 4 and the oxidized silicon layer 3, as second trench 6 is provided underneath the first trench 2. That means, in contrast to Chudzik, that the present invention uses two trenches, the first trench 2 and the second trench 6, to produce the deep trench capacitor.

The Examiner states that Chudzik discloses depositing a conformal aluminum-oxide layer 300 in the first trench. Chudzik discloses, however, that a collar in the upper portion 108 of the trench 100 along a sidewall 210 is formed. A thick dielectric is formed in the trench along sidewall 210, preferably by sidewall oxidation, or alternatively, by oxide deposition (see paragraph [0009]). Referring now to Figure 3 and paragraph [0010] of Chudzik, the oxide sidewalls 210 are recessed to form the collar 300. Hence, Chudzik discloses that the collar 300 is a thick dielectric which can be formed by oxide deposition. In contrast to the present invention, Chudzik neither teaches nor suggests deposition of a conformal aluminum-oxide layer in the first trench. Additionally, Chudzik discloses that the high-K dielectric material (400) could include aluminum oxide (Al_2O_3), but does not disclose that collar 300 is a conformal aluminum-oxide layer.

More specifically, the present invention is advantageous since deposition of the conformal aluminum-oxide layer in the first trench shields the sidewalls. This is achieved by a process which makes very thin aluminum-oxide layers. At the same time, the conformal aluminum-

oxide layer provides a process window which is as wide as possible for processing the second trench underneath the first trench. Hence, the volume of the capacitor built in the deep second widened trench is increased which follows a higher capacitance of the capacitor. The increase in capacitance of the trench capacitor does not enlarge the surface occupied by the memory cell. Thus, at the predetermined integration degree, the capacitance of the capacitor can be increased or at a predetermined capacitance the integration degree of the memory cell can be increased.

Since the recited method is not disclosed by the applied prior art, claim 1 is patentable. Claims 2-7 and 9, depending from claim 1, are similarly patentable.

Claim 8 has been rejected under 35 USC 103(a) as unpatentable over Chudzik. The rejection is respectfully traversed for the same reasons presented in the arguments above, and since the Examiner may not make conclusory statements of obviousness without evidentiary support on the record. The Examiner must cite a reference in support of his/her reasoning, or withdraw the rejection.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no.543822005300.

However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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